

## Set 16.0: Ionic Bond Formation

**Skill 16.01:** Be able to write lewis dot symbols for elements

**Skill 16.02:** Be able to describe the formation of monatomic ions

**Skill 16.03:** Describe the formation of an ionic compound from its elements

**Skill 16.01:** Be able to write lewis dot symbols for elements

### Skill 16.01 Concepts

**When atoms interact to form chemical bonds, only their outer electrons (valence electrons) interact.**

To keep track of valence electrons in a chemical bond or reaction, Lewis dot symbols are used. A Lewis dot symbol consists of the symbol of an element and one dot for each valence electron.

### Skill 16.01 Example 1

Write the Lewis dot symbol for the following elements:	
Li	Na
Mg	Ca
C	Si
F	Cl
What does each of the pairs above have in common?	

Note that in sample problem 1 that:

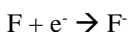
- Except for helium which only has two valence electrons, the number of valence electrons each atom has is the same as the group number of the element.
- The transition metals, lanthanides, and actinides all have incompletely filled inner shells, and in general, we cannot write simple Lewis dot symbols for them.

**Skill 16.02: Be able to describe the formation of monatomic ions****Skill 16.02 Concepts**

Monatomic ions are those formed from a single atom. They form because atoms “want” to have full “s” and “p” subshells. Such a configuration is said to be stable. For example, sodium only has one electron in its outer most shell. In order to achieve a stable configuration, sodium gives away this electron,



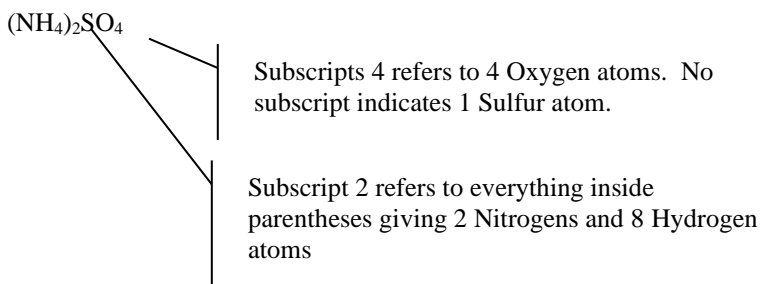
Likewise, fluorine gains an electron to complete its “s” and “p” subshells on the second main energy level,

**Skill 16.02 Example 1**

For each pair, show the formation of the most common ion formed,	
Mg	Ca
B	Al
N	P
F	Cl
What does each pair have in common?	

**Skill 16.03: Describe the formation of an ionic compound from its elements****Skill 16.03 Concepts**

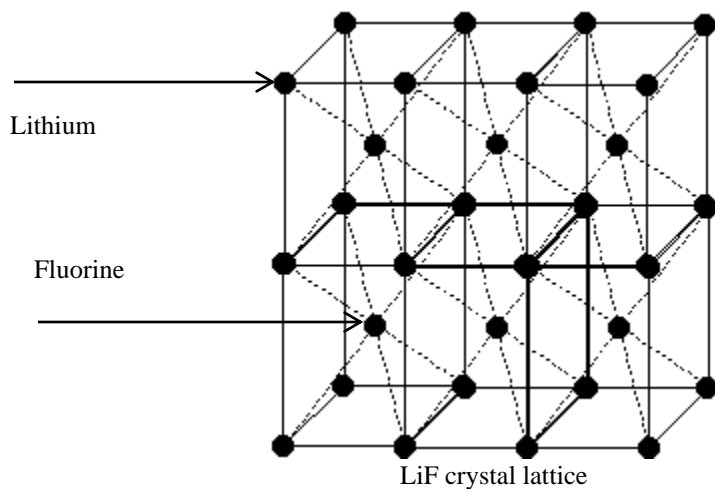
A chemical formula indicates the relative number of atoms of each kind in a compound



An ionic bond is the electrostatic force that holds ions together in an ionic compound. The formation of an ionic compound can be thought to occur in separate steps:

- (1)  $\text{Li} \rightarrow \text{Li}^+ + \text{e}^-$  (endothermic, losing an electron requires energy)
- (2)  $\text{F} + \text{e}^- \rightarrow \text{F}^-$  (exothermic, gaining an electron releases energy)
- (3)  $\text{Li}^+ + \text{F}^- \rightarrow \text{Li}^+\text{F}^-$  (exothermic. Forming bonds releases energy)

The electrical forces of attraction between oppositely charged  $\text{Li}^+$  and  $\text{F}^-$  cause the atoms to come together and form a crystal lattice, NOT an independent unit. In other words, 1 LiF compound does not exist. Rather, many  $\text{Li}^+$  and  $\text{F}^-$  ions come together to form a crystalline structure called a lattice.



#### Skill 16.03 Concepts

Use symbols to show the formation of the following compounds,

(a)  $\text{CaO}$

(b)  $\text{LiBr}$

(c)  $\text{Mg}_3\text{N}_2$

